Scotchcast™ Electrical Resin 281

Two-Part, Semi-Flexible, Filled, Epoxy Liquid Resin

Data Sheet

Product Description

3M™ Scotchcast™ Electrical Resin 281 is characterized by high temperature and electrical stability and excellent retention of flexibility even after prolonged heat aging. It can be cured at low temperatures, but the optimum properties are obtained with the higher temperature cure schedules. This resin should be used instead of Scotchcast Resin 241 where greater mechanical strength, higher tensile strength, better thermal shock and higher thermal conductivity are required. Applications include impregnation and encapsulation of coils, transformers,motors and other electrical and electronic components.

- High temperature rating (155°)
- Low temperature curing
- High thermal conductivity

Handling Properties

Mix Ratio (A:B)	Wt 2:3	
	Vol (%) 37:63	
Initial Viscosity	A = 320,000 cps	
@ 23°C (73°F)	B = 38,000 cps	
	Mixed = 75,000 cps	
Density	A = 1.53 kg/l (12.77 lbs/gal)	
	B = 1.35 kg/l (11.26 lbs/gal)	
Flash Point	A = 202°C (395°F)	
	B = 188°C (370°F)	
Gel Time	21 min. @ 121°C	
Curing Guide	75°C (167°F)	24 hrs
	95°C (203°F)	6-8 hrs
	120°C (248°F)	2-3 hr

Test Methods

[1]Fed. Std. No. 406, Method 1021
[2]Fed. Std. No. 406, Method 1011
[3]Fed. Std. No. 406, Method 1031
[4]MIL-I-16923E
[5]3M Test Method
[6]Fed. Std. No. 406, Method 4021
[7]Fed. Std. No. 406, Method 4041
[8]Fed. Std. No. 406, Method 4031

Typical Properties

*All values shown are typical. They are based on several determinations and are not intended for specification purposes. Product specifications will be provided upon request.

Property	Value*
Color	Cream
Specific Gravity (Cured)	1.43
Compressive Strength[1]	3500 psi
10% Compression	(245 kg/cm²)
Tensile Strength[2]	2100 psi
(1/8" x 1/2" Sample)	147 kg/cm²
Elongation[2] (% @ break)	45
Flexural Strength[3]	1250 psi
(1/2" x 1/2" Sample)	87.5 kg/cm²
Electric Strength[8]	350 V/mil
1/8 (3.175 mm) sample	(13.8 kV/mm)
Hardness (Shore D instantaneous)	65
Thermal Conductivity[4]	12 x 10^{-4}
(Cal/sec/cm²/°C/cm)	
Coefficient of Linear Thermal Expansion[2]	15 x 10^{-5}
(23° C to 113°C)	
(length/unit length/°C)	
Thermal Shock[5] 10 cycles - 65°C to 130°C	
1/4" (6.350 mm) Olyphant Inserts	Pass
Thermal Shock[4]	Pass
Moisture Absorption[4] (% weight increase, 240 hrs. @96% RH)	.32
Water Immersion (sample cured 3 hrs. @ 120°C)	
1000 hrs @ 23°C - % weight gain	0.4
500 hrs @ 70°C - % weight gain	6.2
200 hrs. @ 100°C - % weight gain	8.0
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. @130°C)	
% weight Loss	.17
Hardness Change, (Shore D)	7
Dielectric Constant	
(100 cycles @ 23°C)	3.56
Dissipation Factor	
(100 cycles @ 23 °C)	.054
Volume Resistivity[7]	
(ohm-cm @ 23°C)	>10^{15}
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. @155°C)	
% weight Loss	2.2
Hardness Change, (Shore D)	15
Dielectric Constant	
(100 cycles @ 23°C)	4.03
Dissipation Factor	
(100 cycles @ 23 °C)	.032
Volume Resistivity[7]	
(ohm-cm @ 23°C)	>10^{15}
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. @180°C)	
% weight Loss	3.5
Hardness Change, (Shore D)	18
Dielectric Constant	
(100 cycles @ 23°C)	4.71
Dissipation Factor	
(100 cycles @ 23 °C)	.041
Volume Resistivity[7]	
(ohm-cm @ 23°C)	>10^{15}
Electric Strength[2] [Volts/mil 1/8" (3.175mm) sample]	375 (14,800 volts/mm)

Note: ***These are typical values and should not be used for specification purposes.***

Usage Information

Mixing
Mix the separate parts before removing them from their containers. They may be warmed to 60ºC (140ºF) to aid mixing. Weigh the correct proportions of the separate parts to within 2% accuracy and combine them. Thoroughly blend the mixture until the color is absolutely uniform, or until a homogeneous mixture is attained.

Deaerating
Air introduced during mixing can be removed by evacuating for 5 to 15 minutes at 5 to 10 mm of mercury absolute pressure. Warming the resin to 60°C (140°F) aids air removal. The container side wall should be four times the height of liquid resin to contain the foaming that takes place under vacuum.

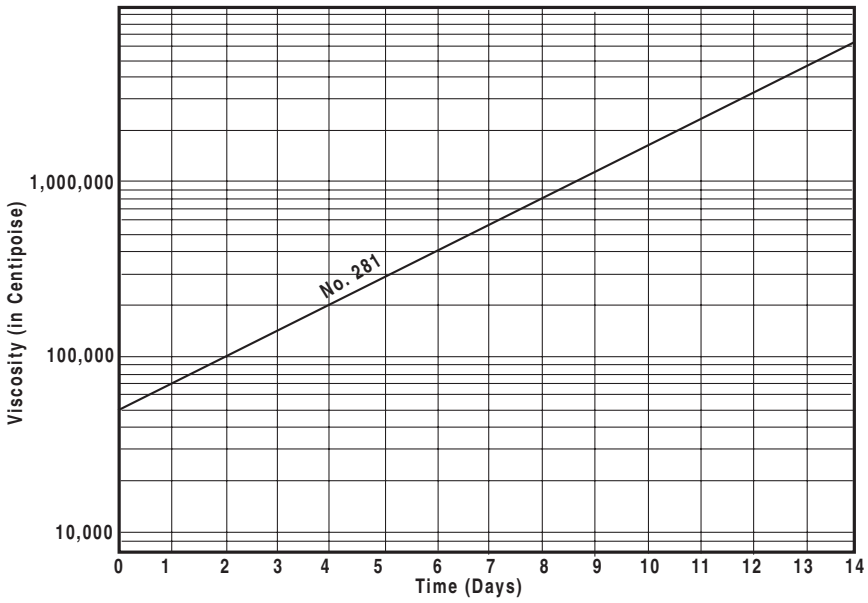
Casting and Impregnating
Pour the warm resin into the preheated 100°C mold. If no mold is used, dip the preheated part into the resin. Heating the resin and mold aids impregnation. For maximum impregnation, evacuate for 5 to 15 minutes at 5 mm of mercury absolute pressure, or pour under vacuum and hold for several minutes before releasing.

Curing
Where minimum stress and maximum shock resistance are required, the lower temperature cure cycle is recommended. Time should be added to the cure cycle to allow the resin to reach the curing temperature.

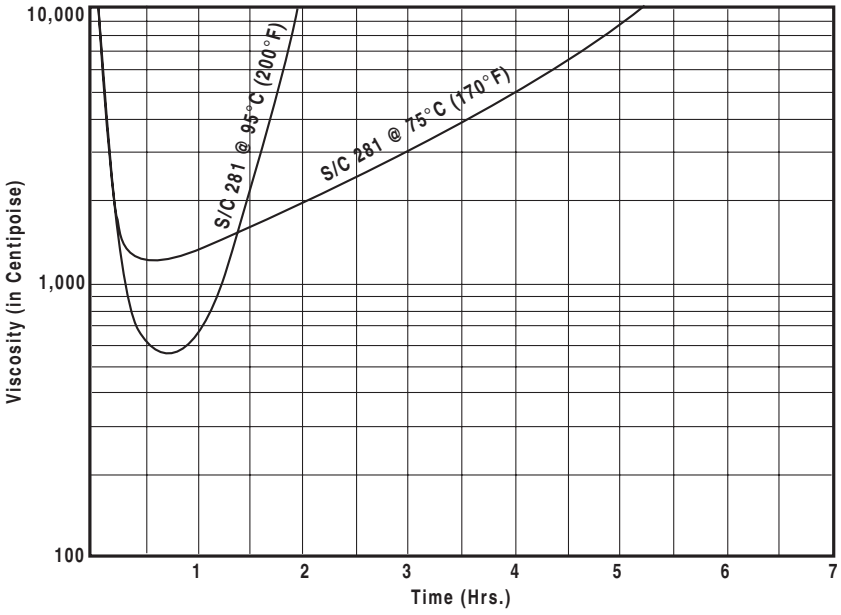
Storage
This resin system has a minimum shelf life of one year. Both parts should be stored in a cool, dry place. When not in use, containers should be kept tightly closed.

Handling and Safety Precautions

Read all Health Hazard, precautionary and First Aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use.

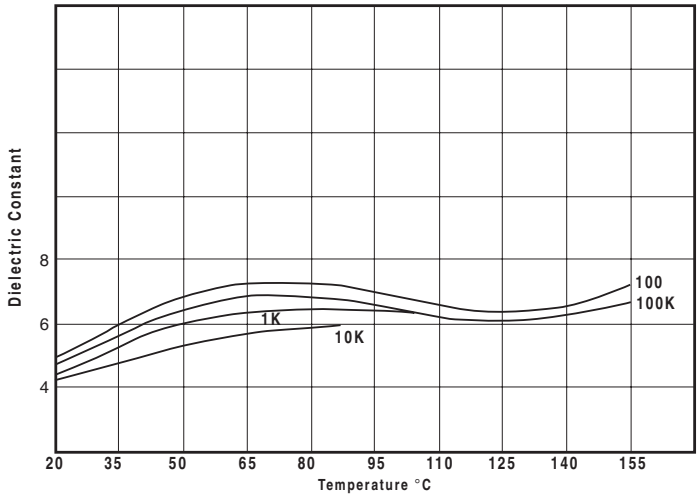


Brookfield Viscosity vs. Time
@23°C (73°F)

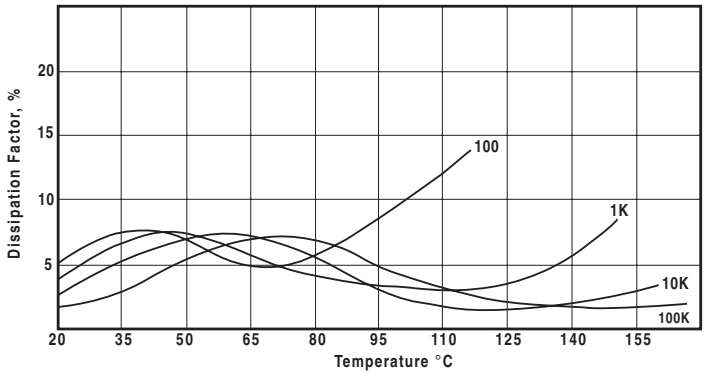


Brookfield Viscosity vs. Time
@75°C (170°F) & 95°C (200°F)

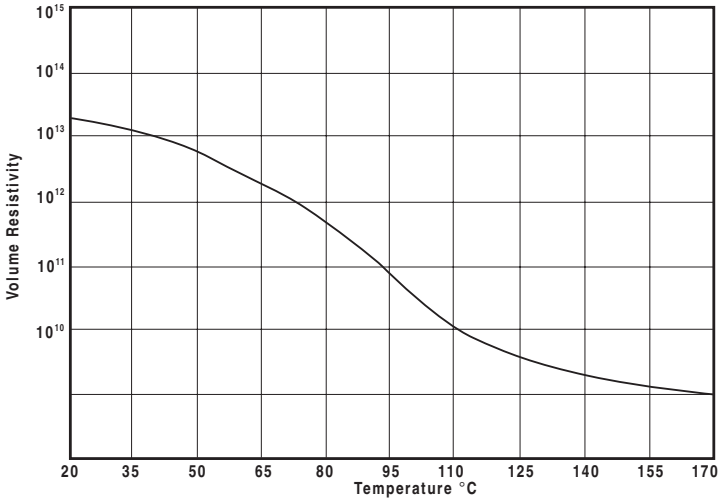
DIELECTRIC CONSTANT
Fed. Std. 406, Method 4021
(Test Frequencies in Hertz)



DISSIPATION FACTOR
Fed. Std. 406, Method 4021
(Test Frequencies in Hertz)



VOLUME RESISTIVITY
(OHM-CM)
Fed. Std. 406, Method 4041



IMPORTANT NOTICE

Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use.

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Electrical Products Division
6801 River Place Blvd.
Austin, TX 78726-9000
800/676-8381
Fax: 800/828-9329
www.3M.com/elpd

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